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Table I. – Measurements (in mm) of *Branchiostegus sawakinensis*, HUJF 11160, caught off Eilat, 13.5.1982.

Weight(g)	135	Scales	8 + 21
TL	235	Gill rakers	19
SL	194	Dorsal	VII 15
Depth	53 (27.3% SL)	Anal	II 12
Snout	20.9 (10.8% SL)	Pectoral	18
Eye diam.	20.2 (10.4% SL)	Pelvic	5
Int. orb.	17 (8.8% SL)	Caudal	17
Head	53.5 (27.6% SL)	Lat. line	51

MEDITERRANEAN FISHES PRESENT IN THE RED SEA : PAN-OCEANIC AND ANTI-LESSEPSIAN SPECIES (1)

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Abstract. About 60 species of fishes exist in the Mediterranean and also in the Red Sea. Many (pan-oceanic) are found in all the oceans, others are considered as recent immigrants from the Red Sea to the Mediterranean (Lessepsian) or vice-versa (Anti-Lessepsian). Nearly 50 Mediterranean species have been reported from the Suez Canal and some of them reached Suez. However, only 5-6 species have been surely found in the Red Sea, were all the captures occurred in the more northern zones.

Résumé. Environ 60 espèces de poissons sont communes à la Méditerranée et à la Mer Rouge. Plusieurs (pan-océaniques) se trouvent dans tous les océans, d'autres sont considérées comme des immigrants récents de la Mer Rouge vers la Méditerranée (Lessepsiennes) ou vice-versa (Anti-lessepsiennes). Presque 50 espèces méditerranéennes ont été signalées dans le Canal de Suez et quelques unes ont atteint Suez. Toutefois, 5-6 espèces seulement ont été sûrement trouvées dans la Mer Rouge, où toutes les captures ont été faites dans les zones les plus septentrionales.

In further lines it will be reminded that faunistic exchanges between the Mediterranean and the Red sea were possible in historical times even before the opening of the Suez canal. However, the latter facilitated the movements that chiefly occurred in a south-north direction (Lessepsian immigration: Por, 1969) but also vice-versa (anti-Lessepsian). According to the available and reliable data, 63 species

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(1) A communication having the same subject of this paper was prepared in occasion of the congress on the Red sea to be held in Ghardaqa (Egypt) in october 1981. As it was delayed to 1982 but it was not possible for me to attend it, the note is presented here in a shorter and revised form. I feel obliged to prof. A. Ben Tuvia and F.D. Por (Zool. Dept., The Hebrew University, Jerusalem) for their suggestions and bibliographical help.

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have been found till now (1981) in both seas. Of them, 23 are panoceanic being present in all the oceans; they chiefly live in warm waters being circumtropical. Other 34 species reached the Mediterranean from the Red sea, only 5-6 did the opposite displacement. Of course, these evaluations leave apart a number of wrong quotations appeared in the literature since more than a century. For the first group (panoceanic) the following list probably can be accepted :

Isurus oxyrhynchus, Alopias vulpinus, Carcharhinus plumbeus, Sphyrna mokarran, S. lewini, Maurolicus muelleri, Chauliodus sloanei, Hirundichthys rondeleti, Hoplostethus mediterraneus, Lobotes surinamensis, Pomatomus saltator, Elagatis bipinnulatus, Seriola dumerili (?), *Coryphaena hippurus, C. equiselis, Scomber japonicus, Euthynnus pelamis, Trichiurus lepturus, Mugil cephalus, Echeneis naucrates, Remora remora, R. brachyptera, Mola mola.*

Some these fishes are only occasional in one or the other sea : single reports are known of both *Sphyrna* and *E. bipinnulatus* from the Mediterranean and of *H. rondeleti* from the Red sea. A few other remarks are needed.

Investigations are necessary on the representatives of the genus *Seriola* in the Red sea, where Klunzinger (1884) mentioned *S. dumerili*. In Jeddah I saw, but could not examine, large specimens apparently deserving such specific name. According to Smith (1959) this species is replaced in the Red sea by *S. rhombica* described by him (p. 259, fig. 5) after a single and small specimen from Algoa bay (South Africa); it is difficult to detect differences from *S. dumerili*. The Mediterranean and Erythraean populations of *Scomber japonicus* require a comparison. The second one probably belongs to the nominal form and the former is usually referred to the Atlantic subspecies (*colias*). *Pristis pectinatus* and *Diodon hystrix*, both circumtropical, have been reported from the Mediterranean but it is very doubtful if Pristidae and Diodontidae really exist there.

The Suez canal continues to attract our attention because a number of biological problems are connected with it (Steinitz, 1968). Several zoologists recognized the mixed origin of the fauna of this peculiar biotope. According to Norman (1927) its ichthyofauna included almost equal numbers of Mediterranean and Erythraean species. Gruvel (1936) indicated a total of 120 : 34 of the first group, 86 of the second. Such evaluations, now obsolete, show how remarkable was the penetration from both sides. However it is difficult to submit a satisfactory picture of the Mediterranean species that to day exist in the canal. It is quite possible that some of those reported long ago are no more found and that new ones came, perhaps unnoticed. The degree of penetration (to Tismsah of Bitter lakes, or to Suez) differs and the occurrence may be only seasonal, irregular or occasional. Taxonomy and nomenclature have remarkably changed during the recent years. It is often possible to bring them up to date but in several cases revisions would be necessary with material at hand. Therefore the list given below cannot be expected to be complete and exact. It includes 46 species mentioned by previous authors or (if marked with asterisk) personally observed on the field (Tortonese, 1948). Here again a few notes will follow the list.

Rhinobatos cemiculus, Raja fullonica (?), *Anguilla anguilla, Dalophis imberbis* (?), *Sardinella maderensis, S. aurita* (?), *Alosa fallax nilotica, Engraulis encrasicolus, *Aphanius fasciatus, Atherina boyeri, Syngnathus abaster, *Hippocampus hippocampus, *Dicentrarchus labrax, D. punctatus, *Epinephelus aeneus, E. alexandrinus, Serranus cabrilla, *Sparus aurata, S. pagrus, Diplodus annularis, D. vulgaris, Lithognathus mormyrus, Sarpa salpa, Pomadasys bennetti, Mullus barbatus, M. surmuletus* (?), *Argyrosomus regius, Umbrina cirrosa, *Caranx crysos (= fusus), Trachurus trachurus, Trachynotus ovatus, Liza ramada, L. aurata, L. saliens, Chelon labrosus, Gobius niger, Lesuerigobius suerii, Pomatoschistus marmoratus, *Parablennius pavo, P. sanguinolentus, P. rouxi, Stromateus fiatola, Trigla lucerna, Dactylopterus volitans, Solea vulgaris aegyptiaca, S. lascaris* (?).

A lancelet is to be added: *Branchiostoma lanceolatum*, said to be abundant in the whole canal (Gruvel, 1933). Picaglia (1894) recorded it (without description) from Assab (Southern Red sea) but more likely he had *Asymmetron lucayanum*, living in all the oceans and in the Red sea. Norman (1927) described *Lesueurigobius suerii* of the canal as a new subspecies (*L.s.ocheticus*). I collected many *Hippocampus* referred by myself to *H. hippocampus* but later by E. Clark to the Erythraean *H. fuscus*: maybe both species exist in the canal. Some Mediterranean fishes penetrated in the latter have a remarkable importance for the fisheries. Many years ago on the market of Ismailia I noticed large numbers of *Engraulis, Dicentrarchus, Sparus* and *Liza* obtained - so I was told - in the Timsah lake.

It is generally obscure if some fishes arriving to Suez were observed only near the town or somewhat farther in the gulf. So we come to an interesting point : what are the Mediterranean fishes really found also in the Red sea, if circumtropical and Lessepsian are omitted ? I can list very few :

Dicentrarchus punctatus : gulf of Suez (Ben Tuvia, 1971).

Argyrosomus regius : gulf of Suez (old literature).

Liza aurata : gulfs of Suez and Aqaba (Ben Tuvia, 1975).

Gobius cobitis : Abu Durba, Sinai coast, gulf of Suez (Goren and Klausewitz, 1978).

Gobius paganellus : El-Hamira, Sinai coast, gulf of Suez (Goren and Klausewitz, 1978).

Also *Carcharhinus plumbeus* (Sandbar shark) probably belong to this small series. It was recently found (Baranes and Ben Tuvia, 1978) near Dahab (Gulf of Elat or Aqaba) and at Ras Muhammad. This species is now reported from all the oceans including the western Indian ocean, from where it perhaps entered into the Red sea although, according to the mentioned authors «the possibility of Suez canal invasion should not be excluded at least as an additional factor in the increase of the *C. plumbeus* population in the Red sea». Such possibility is evident because this is one of the commonest sharks near the Mediterranean coast of Israel. On the other hand, the same condition has been verified in the gulf of Elat.

The «difficult» families Mugilidae and Gobiidae are noteworthy. The fishes belonging to the former are often very similar and easily confused; the members of the latter are mostly small, easily overlooked and often hard to identify. Therefore it would not be surprising that some species of those groups remained unknown in the Red sea until our period of more accurate investigations. Even before the opening of the Suez canal it was not impossible for Euryhaline animals to pass from one sea to the other, wandering across waters of variable salinity (lagoons, branches of the Nile, marine coastal zones and perhaps the ancient connections established by man).

Till now the fishes listed above are known only from the extreme north of the Red sea. Excepting *Carcharhinus plumbeus* it is uncertain if all the collected specimens are just occasional representatives of the species or belong to well fixed populations. In the latter case we could really admit elements common to both faunae, deserving the name of «anti-Lessepsian» even if they penetrated in the Red sea well before than a century ago.

One last point concerns several species that have been included among the Erythraean fishes but must be deleted or the presence of which remains uncertain :

1 – *Sphyrna zygaena* is absent from the Red sea. Its distribution is anti-tropical (Gilbert, 1967).

2 – The sharks of the genus *Mustelus* caught in the Red sea received three names : *M. vulgaris* and *M. laevis* (Klunzinger, 1870), *M. canis* (Ben Tuvia and Steinitz, 1952; Gohar and Mazar, 1964). All the names are applied to Atlantico-Mediterranean species. *M. mosis* is the *Mustelus* endemic in the Red sea; I saw some specimens in Hurghada (Egypt).

3 – According to Ben Tuvia (in litt.) «The presence of *Carcharodon carcharias* and *Exocoetus volitans* is doubtful. It seems that their records in the Red sea, if at all, are based on misidentification».

4 – *Scomberesox saurus* does not exist in the Red sea, where the anti-tropical family Scomberesocidae seems to be wholly absent.

5 – *Serranus cabrilla* was quoted from Massawa (Klunzinger, 1884), Suez (Tillier, 1902), gulf of Suez (Norman, 1927). The last record could be right; however, I have not found others more recent and reliable. This is a very common Mediterranean fish, easy to identify.

6 – *Argyropelecus hemigymnus* and *Euthynnus alletteratus* of the Mediterranean, are replaced in the Indopacific seas by *A. intermedius* and *E. affinis* respectively.

7 – *Squatina squatina, Anguilla anguilla, Engraulis encrasicolus, Syngnathus phlegon, Trachurus trachurus* have been named after confusions with other fishes (or wrong labels).

Two are the conclusions of the present review :

– The abundant penetration of Mediterranean fishes in the Suez canal strikingly contrasts with the extremely scarce «anti-Lessepsian» immigration, restricted to a very limited part of the Red sea.

– The data which I tried to assemble here, simply reflect our present knowledge and a situation in which changes are to be expected even if the Red sea will hardly receive important additions to its ichthyofauna from the Mediterranean.

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